REMARKS/ARGUMENTS

Applicants respectfully request reconsideration and reexamination of the present invention in view of the above-presented amendments and the following remarks.

Status of the Claims:

Claims 1 through 16 are pending in the subject patent application. Claims 9 and 14 are objected to, but allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 1 through 8, 10 through 13, 15 and 16 are rejected.

The Examiner has objected to the disclosure based upon informalities pertaining to drawing numerals 15, 17, 200, 202, 210, 222, 224 and 230 not being found in the Specification. Applicants have amended Paragraphs [0035], [0038] and [0043] by inserting the subject drawing numerals. The amendments are fully supported by the Specification, particularly in view of Paragraph [0033] which incorporates by reference United States Patent 5, 868,918 which discloses a planar, flat plate stack presenting alternating electrolyte plates and electrically conductive interconnects. No new matter has been added to the Specification.

Applicants have amended independent claims 1 and 10 by incorporating the limitation that the interconnect "consists of a single layer" of the enumerated compositions of matter. Applicants have amended independent claims 13 and 15 by incorporating the limitation that at least one interconnect of the electrochemical solid-state device "consists of a single layer" of the enumerated compositions of matter. The claims, as amended, do not present new matter and are fully supported by the Specification and Figures (for example, Fig. 2, element 216) which teaches an interconnect having a single layer. Moreover, Paragraph [0027] of the Specification states that the claimed interconnects can be formed from layer or [a] layer of perovskitic material:

> **[0027]** The compositions of matter in general have perovskitic and preferably perovskite structure with the above lanthanide(s) and calcium being in the A-site and manganese being in the B-site. Perovskitic structures include true perovskites that have a three dimensional cubic array of small diameter metal ion octahedra, as well as structures that incorporate ***a perovskite-like layers or layer,*** i.e. a two dimensional array of small diameter metal ion octahedra arranged in a two dimensional square array. These perovskite-like arrays are charge stabilized by larger diameter metal ions, or other charged layers. Examples of perovskitic structures include cubic perovskites, brownmillerites, Aurivillius phases, and the like. (***emphasis added***)

Allowability of Claims 9 and 14

Claims 9 and 14 are objected to as being dependent upon a reject base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants acknowledge the Examiner's statement that the prior art does not disclose interconnect materials in which the three "x" coefficients add up to 1, the two "y" components total between 1.02 and 1.05, and both calcium and strontium are present.

Discussion of the Claimed Invention (as amended)

The present invention, as presented in claims 1 through 12, *as amended*, relates to an interconnect for an electrically driven solid electrolyte oxygen separation device ***consisting** of a single layer* comprising specified compositions of matter. The present invention, as presented in claims 13 through 16, *as amended*, relates to an electrochemical solid-state device comprising at least two electrochemical cells which are electrically connected in series by one or more interconnects wherein at least one interconnect ***consists*** *of a single layer* comprising such specified compositions of matter.

The compositions of matter from which the *single layer* of the interconnect is formed comprises a composition of matter represented by the general formula:

$$\mathbf{Ln_xCa_{x'}A_{x''}Mn_yB_{y'}O_{3-\delta}}$$

wherein

Ln is selected from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu;

A is selected from the group consisting of Sr, Ba and Y;

B is selected from the group consisting of Cu, Co, Cr, Fe, Ni, Zn, Nb, Zr, V, Ta, Ti, Al, Mg, and Ga;

$0.1 \leq x \leq 0.9$; $0.1 \leq x' \leq 0.9$; $0 \leq x'' \leq 0.5$;

$0.5 < y < 1.2$; and $0 \leq y' \leq 0.5$;

provided that $x + x' + x'' = 1$ and $1.2 > y + y' > 1.0$

wherein δ is a number which renders the composition of matter charge neutral.

Paragraph [0006] of the Specification set forth the roles to be formed by the interconnects of the present inventions:

> [0006] The interconnects of these subject devices fulfil several roles. The interconnect (1) provides for separation of gas passages between anode and cathode sides of adjacent electrolyte plates, (2) provides the channels by which feed and product gas streams are manifolded, (3) ***acts as an electronic conductor to connect the solid electrochemical cells in series***, (4) prevents back diffusion of oxygen from the product stream to the feed stream, and (5) in many cases due to the relative thickness of the components, the interconnect provides additional mechanical support to the stack. (***emphasis added***)

Rejections Under 35 USC § 102:

EP 1 081 778 A1 ("Aizawa I")

Claims 1 through 4, 6 through 8, 10, 12, 13, 15 and 16 are rejected as being anticipated by EP 1 081 778 A1 ("**Aizawa I**") **Aizawa I** teaches solid electrolyte fuel cell comprising an air electrode, a solid electrolyte film, a fuel electrode and an interconnector. The interconnector is formed from (1) a gas tight ceramic film formed on an air electrode and (2) a ceramic intermediate layer formed between the air electrode and the interconnector film so that is possible to form a tight film of a sintering-resistant material such as lanthanum chromite. Paragraph [0134] of **Aizawa I** states:

> [0134] As the fourth aspect of the present invention, when an interconnector film of a tight ceramics film (hereinafter also referred to as a tight ceramics film) is formed on an air electrode (hereinafter also referred to as a porous substrate), a ceramics intermediate layer is formed between the air electrode and the interconnector film so that it is possible to form a tight film of a sintering-resistant material such as lanthanum chromite, etc., by the wet method.

Thus, **Aizawa I** teaches an interconnector having at least two layers, namely a tight ceramics film, which according to the document is a lanthanum chromite or lanthanum manganite and a ceramics intermediate layer. The ceramics intermediate layer is disclosed in Paragraph [0152] of **Aizawa I** which states:

> [0152] [In] the formation of the ceramics intermediate layer according to the present invention, when the coarse power composition is $(La_{1-x1}M_{x1})_{y1}MnO_3$ and the fine powder composition is $(La_{1-x2}M_{x2})_{y2}MnO_3$, then, its is preferred that they are within the range of $0<x1\leq x2\leq 0.4$, $0.9\leq y1\leq 1$ and $0.9\leq y2\leq 1$.

Accordingly, the interconnect of **Aizawa I** requires presence of at least two layers, whereas the interconnect of the claims, as amended, consist of a single layer only. Therefore, the claims of the present invention are novel over **Aizawa I.**

JP 7-320,757 ("Aizawa II")

Claims 1 through 8, inclusive are rejected under 35 U.S.C. 102(b) as being anticipated by JP 7-320,757 ("**Aizawa II**") which teaches an interconnector suitable for use in a solid electrolytic fuel cell wherein the interconnector has at least two layers. The interconnect has (1) a first layer formed on the air electrode surface, which consists of a La-Sr-Mn perovskite oxide, (2) a first layer formed on the air electrode surface which consists of $La_{1-x}M_{x+y}MnO_3$ and (3) a second layer formed on the first layer, which consists of $La_{1-x}M_{x+y}CrO_3$. (subscripts definitions omitted).

Accordingly, the interconnect of **Aizawa II** requires presence of at least two layers, whereas the interconnect of the claims, as amended, consist of a single layer only. Therefore, the claims of the present invention are novel over **Aizawa II.**

EP 974,564 A1 ("Batawi I") and U.S. Patent 6,228,522 ("Batawi II")

Claims 1 through 4, 6 through 8 and 13 are rejected under 35 U.S.C. 102(b) and 35 U.S.C. 102(e) as being anticipated by EP 974, 564 A1 ("**Batawi I**") and U.S. Patent 6,228,522 ("**Batawi II**") which teach a coating for a fuel cell interconnect where the coating has the formula ABO_3 where A is selected from La and Ca; and B is Mn. The interconnect is formed from $CaCrO_3$. Suitable compositions for the interconnect (as opposed to the coating) are presented in **Batawi ii** (col. 3, lines 10 through 26). **Batawi II** (col. 3, lines 31 through 34 states that the interconnect is created by binary alloying CrO and CaO with $LaCrO_3$.

Accordingly, the interconnect of **Batawi I and II** require presence of at least two layers, whereas the interconnect of the claims, as amended, consist of a single layer only. Therefore, the claims of the present invention are novel over **Batawi I and II**

Rejection Under 35 USC § 103:

Claims 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Aizawa I** which teaches an interconnector having at least two layers, namely a tight ceramics film, which according to the document is a lanthanum chromite or lanthanum manganite and a ceramics intermediate layer as set forth in Paragraph [0152] of **Aizawa I** which states:

> [0152] [In] the formation of the ceramics intermediate layer according to the present invention, when the coarse power composition is $(La_{1-x1}M_{x1})_{y1}MnO_3$ and the fine powder composition is $(La_{1-x2}M_{x2})_{y2}MnO_3$, then, its is preferred that they are within the range of $0<x1\leq x2\leq 0.4$, $0.9\leq y1\leq 1$ and $0.9\leq y2\leq 1$.

Aizawa I fails to teach, suggest or motivate one of ordinary skill in the art of fuel cells to eliminate the "tight ceramics film" of the interconnect of **Aizawa I** and to only use the "ceramics intermediate layer" of **Aizawa I** as a single layer interconnect for electrically driven solid electrolyte oxygen separates devices of the claimed invention. In fact, **Aizawa I** teaches away from eliminating the "tight ceramics film" as the tight ceramics film is essential to the invention in order to control gas permeation flux. Therefore, the claims, as amended are not obvious as a matter of law in view of **Aizawa I**

The Examiner states that the prior art made of record and not relied upon is considered pertinent to Applicants' disclosure in that Minh et al. (U.S. 5,356,730) and Chiao (US 6,228,520) disclose fuel cells with various interconnect materials. Applicants respectfully submit that electrically driven solid electrolyte oxygen separation devices and fuels cells constitute divergent art.

Summary

Applicants respectfully submit that the rejections and objections set forth by the Examiner have been overcome and Applicants request favorable reconsideration and prompt allowance of the pending claims.

Respectfully submitted,

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